MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

PAM0135 – ALGEBRA

(Foundation in Information Technology)

16 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

Question 1 (10 marks)

a) Simplify:

i. $\left(\dfrac{(-2)^3 x^{-4}(yz)^2}{3^{-2}xy^3z^{-1}}\right)^{-2}$. [3 marks]

ii. $\sqrt[3]{16a^{10}b^3} \times \sqrt[3]{4a^{-4}b^2}$. [2 marks]

b) Rationalize the denominator : $\dfrac{xy}{4\sqrt[3]{x^2y}}$. [2 marks]

c) Simplify the rational expression: $\dfrac{x+\dfrac{x-2}{x+1}}{\dfrac{x(x+2)-2}{x^2-1}}$. [3 marks]

Question 2 (10 marks)

a) Solve : $\sqrt{x+6}-\sqrt{x-2}=2$. [3 marks]

b) Solve the equation : $x^{2/3}-9x^{1/3}+8=0$. [4 marks]

c) Solve the inequality : $3\left|\frac{4}{7}x-2\right|+4<13$. [3 marks]

Question 3 (10 marks)

a) Given $f(x)=3x+1$ and $g(x)=\frac{1}{2}x^2$.

i. Find $(f\times g)(x)$ and state its domain. [2 marks]

ii. Find $(f\circ g)(2)$. [2 marks]

b) Find the inverse function of $f(x)=\dfrac{2x-5}{3x+4}$. [3 marks]

c) Explain how the following graph are obtained from the graph of $y=f(x)$.

i. $y=f(x-2)$ [1 mark]

ii. $y=-f(x)$ [1 mark]

iii. $y=f(x)+3$ [1 mark]

Continued ...

Question 4 (10 marks)

a) Expand the expression $\left(x^3+\frac{2}{x}\right)^5$ by using Binomial Theorem. Hence, determine the coefficient of x^7. [4 marks]

b) For an arithmetic sequence: $-11,-7,-3,1,\ldots$. Find the tenth term and the sum of the first 20 terms. [3 marks]

c) Find the sum of the first 5 terms of the sequence: $\frac{1}{4},\frac{1}{8},\frac{1}{16},\frac{1}{32},\ldots$. Hence, determine whether the infinite geometric series, $\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32},\ldots$ converges or diverges. [3 marks]

Question 5 (10 marks)

a) Find the domain of a function $f(x)=\sqrt{x^2-4}$. [3 marks]

b) Solve $e^{2x+3}-10=35$. Leave your answer in 3 decimal places. [2 marks]

c) Given the piece-wise defined function below,

$$f(x)=\begin{cases}|x| & if \quad -1\le x\le 1\\ x^2 & if \quad 1<x<3\\ x-3 & if \quad 3\le x<5\end{cases}$$

Compute the value of $2f(2)-f(4)+3f(1)$. [2 marks]

d) Use transformations to graph the function $f(x)=-2x^2+7$. State the intercept(s), is any. [3 marks]

End of Paper

Keys Formulas

1. Difference and Sum of Two Cubes: $x^3 \pm a^3 = (x \pm a)(x^2 \mp ax + a^2)$

2. The quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

3. Arithmetic Sequence: $a_n = a + (n-1)d$; $S_n = \dfrac{n}{2}[2a_1 + (n-1)d] = \dfrac{n}{2}[a_1 + a_n]$

4. Geometric Sequence: $a_n = ar^{n-1}$; $S_n = a\dfrac{1-r^n}{1-r}$; $r \neq 0,1$; $S_\infty = \dfrac{a}{1-r}$

5. The Binomial Theorem:

$$(a+b)^n = \binom{n}{0}a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{k}a^{n-k}b^k + \ldots + \binom{n}{n}a^0 b^n$$